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REMARKS

Specification

The disclosure is objected to because of an informality in the Cross-Reference section.

Applicants have corrected the Cross-Reference section (page 2 of the amendment filed on 27 August 2004) to indicate that US Appl. Ser. No. "09/164,421" is actually US Appl. Ser. No. --09/874,175--. No new matter has been added.

Claim Rejections - 35 USC §102

Claims 11-14 are rejected under 35 U.S.C. §102(e) as being anticipated by Passemard (US 2001/0004550 A1, hereinafter "Passemard").

With regard to claims 11-14, Applicants respectfully traverse the rejections since the Applicants' claimed combination, as exemplified by claim 11, includes the limitation not disclosed in Passemard of:

"a dielectric layer of non-barrier dielectric material capable of being changed into a barrier dielectric material and having a opening provided therein, the dielectric layer around the opening of the barrier dielectric material;" [underlining for clarity]

The Examiner states in the Office Action:

- The interconnection structure includes a sublayer of SiCH (11 in Fig. 3) and a sublayer of SiOCH (12 in Fig. 3);
- Both sublayers (11, 12) have openings formed through them that are subsequently filled with copper (9);"

In Passemard, as stated by the Examiner above, there are two separate sublayers of SiCH and SiCOH, each separately deposited. This is shown in Passemard FIG. 3 and explained in paragraph [0025]:

"The interface layer 10 is used for forming a hard mask and includes a SiCH sublayer 11 deposited on the dielectric material layer 5 and a SiOCH sublayer 12 deposited on the SiCH sublayer 11." [underlining for clarity]

SiOCH is a non-barrier dielectric material and SiCH is a barrier dielectric material, but Passemard provides no disclosure, teaching, or suggestion that the former may be a changed form of the latter.

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In the claimed invention, the claimed dielectric layer is a non-barrier dielectric material that is capable of being changed into a barrier dielectric material. This barrier dielectric material provides the antecedent basis for the barrier dielectric material that is around the opening in the claimed dielectric layer.

Thus, the claim language discloses to one having ordinary skill in the art that the dielectric layer includes a barrier dielectric material made from the non-barrier dielectric material of the dielectric layer, which is described in detail in the specification.

To forestall an indefiniteness rejection, Applicants submit that the fact that claim language may not be precise, does not automatically render the claim indefinite under 35 U.S.C. 112, second paragraph. *Seattle Box Co., v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 221 USPQ 568 (Fed. Cir. 1984). Acceptability of the claim language depends on whether one of ordinary skill in the art would understand what is claimed, in light of the specification.

Based on the above, it is respectfully submitted that claims 11-14 are allowable under 35 USC §102(e) as not being anticipated by Passemard because:

““Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, *arranged as in the claim.*” [emphasis added] *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.* (730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984)(citing *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983))).

Claim Rejections - 35 USC §103

Claims 15-18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Passemard (US 2001/0004550 A1, hereinafter “Passemard”) in view of Ito (US 6,372,114, hereinafter “Ito”).

With regard to claims 15-18, Applicants respectfully traverse the rejections since the Applicants’ claimed combination, as exemplified by claim 15, includes the limitation not disclosed in Passemard of:

“a dielectric layer of non-barrier dielectric material capable of being reduced into a barrier dielectric material and having a opening provided therein, the dielectric layer around the opening of the barrier dielectric material;” [underlining for clarity]

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The Examiner states in the Office Action:

- “• The interconnection structure includes a sublayer of SiCH (11 in Fig. 3) and a sublayer of SiOCH (12 in Fig. 3);
- Both sublayers (11, 12) have openings formed through them that are subsequently filled with copper (9);”

In Passemar, as stated by the Examiner above, there are two separate sublayers of SiCH and SiCOH, each with an opening.

It is respectfully submitted that Passemar does not teach or suggest the claimed dielectric layer that includes a barrier dielectric material made from the non-barrier dielectric material of the dielectric layer.

Based on the above, claims 15-18 are allowable under 35 U.S.C. 103(a) as being unobvious over a combination with Passemar because Passemar does not teach or suggest the limitation set forth by the Examiner and because:

“[T]he prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.” *In re Vaack*, 947 F2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)

The Examiner continues in the Office Action:

“However, Passemar lacks a seed layer that lines the opening, which is a limitation set forth in claim 15 of the applicant's invention.

Ito teaches the use of a copper seed layer (109 in Fig. IC) to line openings formed in an insulator (105 in Fig. IC) for the subsequent plating of a copper layer (110 in Fig. ID) to fill the openings (also see column 5, lines 9-43).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Passemar and Ito in order to fill the openings of Passemar with copper by using a plating process that includes a copper seed layer as taught by Ito. Copper plating is one known way to deposit copper and Ito recognizes that a seed layer is needed as an electrode for such plating processes (see column 5, lines 30-31).”

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Applicants respectfully disagree.

Taken as a whole, Passemard teaches that a seed layer is not required by stating that a conductor is deposited on the barrier layer without a seed layer as shown in FIG. 10 and taught in para. [0031]:

"A titanium nitride or tantalum nitride layer 8...also adheres to the walls and bottom of the hole 7, which is then filled with copper." [deletion for clarity]

Taken as a whole, Ito teaches that a seed layer is required by stating that a barrier metal layer deposited by sputtering has a sputtered copper seed layer in col. 5, lines 20-28:

"With reference to FIG. 1C, a second barrier metal layer 108 of titanium nitride is entirely deposited by a sputtering method... A copper seed layer 109 is then deposited on the second barrier metal layer 108 by a sputtering method." [deletion for clarity]

Thus, neither Passemard nor Ito teaches or suggests the subject matter as a whole.

Therefore, the combination taken as a whole, does not teach or suggest the claimed combination and appears to teach away from the combination. It is respectfully submitted that claims 15-18 are allowable under 35 U.S.C. 103(a) as being unobvious over Passemard in view of Ito because it is required that the subject matter be obvious as a whole:

"A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made."

In addition, Passemard teaches that a seed layer is not required, and Ito teaches that a seed layer is required. Neither reference teaches, suggests, or provides a motivation for the combination. It is respectfully submitted that claims 15-18 are allowable under 35 U.S.C. 103(a) as being unobvious over Passemard in view of Ito because the CAFC has held In *In re Sang-Su Lee*, 277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002), that the conclusion of obviousness may not be made from common knowledge and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference.

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The other references cited by the Examiner showing the prior art have been considered and are not believed to disclose, teach, or suggest, either singularly or in combination, Applicants' invention as claimed.

Response to Examiner's Arguments

The Examiner indicated that Applicants' arguments filed 27 August 2004 (see pages 5-8) have been fully considered but they are not persuasive.

Applicants have clarified the Applicants' arguments and request reconsideration thereof.

Further, Applicants respond to the Examiner's arguments below.

Regarding the rejection of claims 11-14,

"Regarding the above rejection of claims 11-14 under 35 U.S.C. 102(e) as being anticipated by Passemard (US 2001/0004550 A1), the applicant argues that Passemard fails to show their SiCH and SiCOH layers arranged as the applicant does in Fig. 3. It is noted that this arrangement upon which applicant relies is not recited in claims 11-14. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). It is further noted that the applicant closes their specification with the statement: "All matters hither-to-fore set forth or shown in the accompanying drawings are to be interpreted in an illustrative and non-limiting sense" see page 8, lines 22-23) and, per MPEP section 2111.01, "the words in a claim are generally not limited in their meaning by what is shown or disclosed in the specification".

Instead, per MPEP section 2111, the applicant's claims have been given their broadest reasonable interpretation. That is, it is not unreasonable to interpret that "around" as used in claim 11 has the same meaning as "near". The Passemard reference shows the SiCOH layer (12) formed directly over the SiCH layer (11) in Fig. 3 and the same opening formed through both the SiCOH layer (12) and the SiCH layer (11) in Fig. 9. Accordingly, portions of the SiCH material near the opening formed through the SiCH layer (11) would also be near the opening formed through the SiCOH layer (12). The same reasoning is also applicable to the above rejection of claims 15-18 under 35 U.S.C. 103(a) as being unpatentable over Passemard (US 2001/0004550 A1) in view of Ito (US 6,372,114)."

The arguments above have been clarified to show that it is not the location of the barrier dielectric material that the inventors consider to be their invention but the

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combination, which includes a claimed dielectric layer that includes a barrier dielectric material made from the non-barrier dielectric material of the dielectric layer

With regard to claims 15-18, the Examiner states:

"Further, regarding the above rejection of claims 15-18 under 35 U.S.C. 103(a) as being unpatentable over Passemard (US 2001/0004550 A1) in view of Ito (US 6,372,114), the applicant argues against the references individually. That is, the applicant addresses Passemard taken as a whole and then addresses Ito taken as a whole, instead of addressing the combination of Passemard and Ito taken as a whole. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)."

It is respectfully submitted that *In re Keller*, *supra*, and *In re Merck & Co.*, *supra*, relate to attacking individual portions of the individual references. Applicants have not done this. Instead the Applicants have argued that the references, each taken as a whole, do not render the claimed subject matter, as a whole, obvious to one having ordinary skill in the art and have cited the case law support for this (*In re Vaeck*, *supra*).

With regard to claims 15-18, Applicants respectfully also traverse the rejection since the Applicants' claimed combination includes the limitation not taught or suggested by the combination of Passemard and Ito, taken as a whole, of:

"a dielectric layer of non-barrier dielectric material capable of being reduced into a barrier dielectric material and having an opening provided therein, the dielectric layer around the opening of the barrier dielectric material;" [underlining for clarity]

The Examiner relied on the same arguments as for claims 11-14 for everything except the claimed seed layer.

Thus, Applicants' arguments related to these claims are applicable here with the modification that the combination of Passemard and Ito, taken as a whole, do not teach or suggest a claimed dielectric layer that is a non-barrier dielectric material that is capable of being reduced into a barrier dielectric material. This barrier dielectric material provides the antecedent basis for the barrier dielectric material that is around the opening in the claimed dielectric layer.

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Therefore, the claim language discloses to one having ordinary skill in the art that the dielectric layer includes a barrier dielectric material made from the reduced non-barrier dielectric material of the dielectric layer.

Further, it was and is submitted that no motivation for the combination appears in either reference. Without this motivation, a *prima facie* case for obviousness cannot be established. If the Examiner believes this motivation is present, it must be based on the Examiner's personal knowledge so an Examiner Affidavit disclosing the Examiner's personal knowledge regarding this limitation is timely requested pursuant to 37 CFR §1.104(d)(2).

With regard to the seed layer, Passemard teaches direct contact between the barrier layer and conductor while Ito teaches a seed layer between the barrier layer and conductor so the references taken as a whole teach away from each other and the combination. Where there is a specific hint or suggestion in a particular reference, but the references as a whole teach away from each other, the combination cannot be obvious according to the CAFC:

"We have noted elsewhere, as a "useful general rule," that references that teach away cannot serve to create a *prima facie* case of obviousness" *In re* Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984)

Based on the above, it is respectfully submitted that claims 11-14 are allowable under 35 U.S.C. §102(e) as not being anticipated by Passemard and that claims 15-18 are allowable under 35 U.S.C. §103(a) as being unobvious over Passemard in view of Ito.

Conclusion

In view of the above, it is submitted that the claims are in condition for allowance and reconsideration of the rejections is respectfully requested. Allowance of claims 11-18 at an early date is solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including any extension of time fees, to Deposit Account No. 01-0365 and please credit any excess fees to such deposit account.

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Respectfully submitted,



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